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NOTES ON THE CIRRIPEDE GENUS *MEGALASMA*.

BY HENRY A. PILSBRY.

The genus *Megalasma* was instituted by Dr. P. P. C. Hoek¹ for a pentaspidian barnacle dredged by the *Challenger* in the Philippine Archipelago, which was said to differ from *Pæcilasma* by having the umbo of the scutum situated on the ocludent margin above the basal angle, whereas in *Pæcilasma* the umbo is at the basal angle, as in all other *Lepadina*.

In my work on the cirripedes of the U. S. National Museum,² I had occasion to show that *Pæcilasma*, as understood by Hoek and Gruvel, consists of two series of species, (1) those with the sides of the carina narrow (= *Pæcilasma* Darwin), and (2) those with the sides notably widened towards the base. Moreover, this second group differs from *Megalasma* only by having the base of the scutum nearly at a right angle with the ocludent border, while in the type of *Megalasma* the basal margin has rotated through an arc of about 90°, bringing it in line with the lower part of the ocludent margin. The position of the umbo is morphologically the same in *Megalasma* and *Pæcilasma*—that is, at the base of the ocludent margin proper, where this joins the peduncular margin. The alleged elevation of the umbo on the ocludent margin in *Megalasma* does not exist. It is merely apparent on account of the continuity of the ocludent and peduncular margins, as shown in fig. 2*a*, where the umbo is at *u*, the margin of the peduncular orifice at *po*. In my opinion, therefore, the genus *Pæcilasma* should be restricted to species like those included by Darwin, while all forms with the sides of the carina wide and the internal plate well developed must be transferred to *Megalasma*. The mere change in the shape of the scutum at the borders of the peduncular foramen is insufficient for the separation of genera.

Megalasma, in the limits here assigned, is distinguished from *Pæcilasma* by the structure of the carina, which has wide sides near the base, and a well-developed oblique plate or septum within the base, bridging across the cavity of the carina, and terminating above in two projections or teeth. The species of *Pæcilasma* chiefly live upon the cara-

¹ *Challenger Report*, VIII, Cirripedia, p. 50, 1883.

² *Bulletin of the U. S. Nat. Mus.*, No. 60, p. 82, 1907.

paces of crabs, while *Megalasma* has been found mainly on sea-urchin spines and upon other cirripedes.

Megalasma carinodentatum Weltner³ was described from a single example, and derived its name from the projection or tooth on the roof of the carina. This projection, however, may very likely be pathologic, consequent upon an injury at the end of the carina when half grown.

COMPARISON OF *M. BELLUM* AND *M. MINUS*.

M. bellum (Pils.)⁴ is closely related to *M. minus* Annandale.⁵ The receipt of specimens of the latter, which I owe to the courtesy of Dr. N. Annandale, of the Indian Museum, enables me to compare the two species more thoroughly than has hitherto been possible, since the

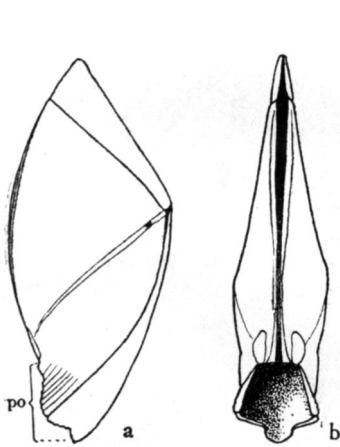


Fig. 1.—*Megalasma minus* Annand. *a*, lateral, and *b*, ventral view, $\times 7\frac{1}{2}$. *po*, margin of the peduncular orifice.

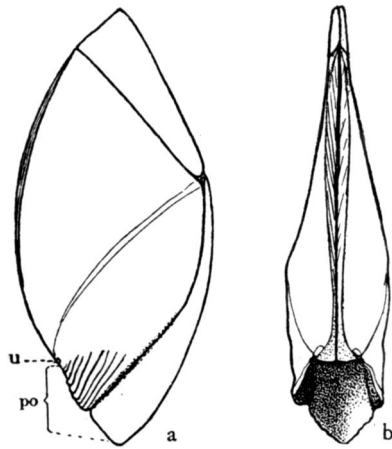


Fig. 2.—*M. bellum* Pils. *a*, lateral, and *b*, ventral view, $\times 4$. *u*, umbo of the scutum.

published figures show only the external aspect of the capitulum, and the internal features have not been described or figured.

Megalasma minus and *M. bellum* are alike in general shape and in sculpture, but differ in size and in various details of the scuta and

³ *Sitzungs-berichte der Gesellschaft naturforschender Freunde zu Berlin*, Jahrg. 1894, p. 84.

⁴ *Pacilasma bellum* Pilsbry, *Bulletin of the Bureau of Fisheries*, XXVI, p. 183, pl. IV, fig. 6 (June 29, 1907). This paper was prepared in 1905, hence before I knew of the existence of *M. minus*.

⁵ *Megalasma striatum* subsp. *minus* Annandale, *Annals and Magazine of Natural History*, ser. 7, XVII, p. 399 (April, 1906); *Illustrations of the Zoology of the Royal Indian Marine Survey Ship Investigator*, Entomostraca, pl. I, fig. 8 (1907).

carina. *M. minus* is slightly narrower than *M. bellum* throughout. The dimensions of the type were not given by Dr. Annandale in his original account, but the name implies that it is smaller than *M. striatum*, which has a capitulum 11 mm. long. The figure of his type, subsequently published, is said to be enlarged six diameters, which would make the capitulum about 9 mm. long. The largest specimen I have seen, a ♀ bearing a large mass of eggs, measures 6.5 mm. in length of capitulum. *M. bellum* attains a much greater size. The type is 14.5 mm. long, and I have seen a great number of specimens from many localities with capitula from 12 to 15 mm. long.

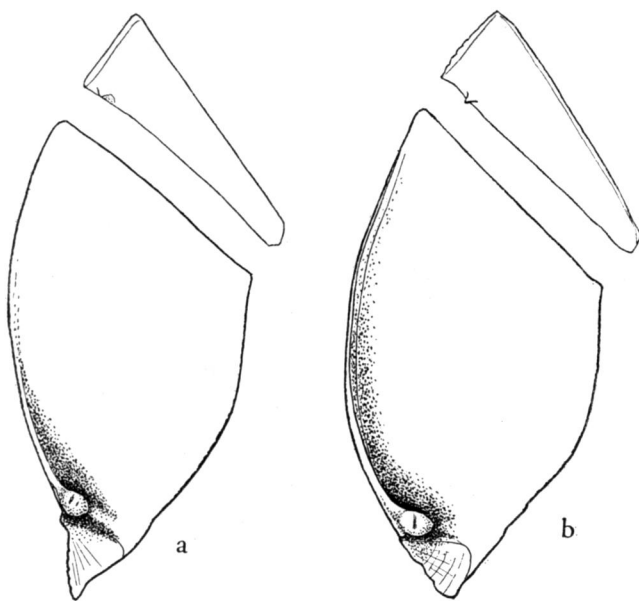


Fig. 3.—a, internal view of the left scutum and tergum of *M. minus*, $\times 10$, and b, *M. bellum*, $\times 5$.

The lateral borders of the peduncular foramen, in a lateral view of the capitulum, are nearly straight in *M. bellum* (fig. 2, *po*), but in *M. minus* these margins arch outwards more or less strongly (fig. 1, *po*).

The primitive valves, visible at the umbones, are convex, densely cellular in both species, irregularly trapezoidal in outline, with sub-parallel occludent and dorsal borders, the latter much the shorter. The anterior (basal) end is squarely truncate, the posterior end oblique. In *M. minus* the primitive valves measure 0.66 mm. long, 0.25 wide (pl.31,

fig. 9). In *M. bellum* the valves are a little wider, measuring 0.75 x 0.3 mm. In both species a ridge or angle close to the occludent border of the scutum defines a narrow and nearly flat ventral area; and towards the base a smooth sunken area separates the primitive valves and the sculptured portions of the scuta, as shown in figs. 1b, 2b.

The scuta, when removed, are seen to differ in various respects. The occludent border is more bowed in *M. bellum*, and the basal portion, below the umbonal tooth, is wider than in *M. minus*. In both species the umbonal tooth is stout and high in both valves. There is no socket in the carinal margin for the reception of the tooth of the carina, such as Hoek described and figured in *M. striatum* (see fig. 3).

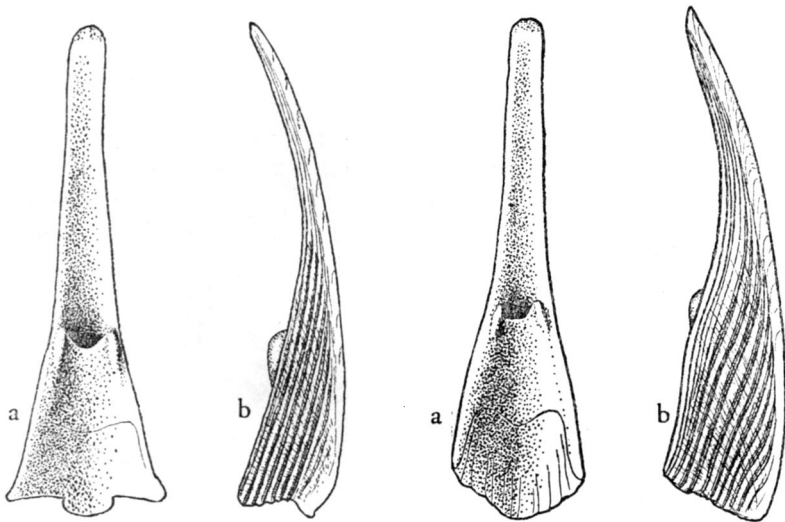


Fig. 4.—*M. minus*, carina in ventral and lateral views. Fig. 5.—*M. bellum*, carina in ventral and lateral views.

The carina in *M. minus* (fig. 4) has much narrower sides, which are more expanded at the baso-lateral angles. The basal margin has a rounded median projection, and the articulating teeth are larger. In *M. bellum* (fig. 5) the basal margin is simply arcuate. In other respects the carinae are similar. The shape of the base of the carina affects the shape of the peduncular foramen, as viewed from the ventral side (see figs. 1b and 2b). The difference of shape is equally pronounced if *M. minus* is compared with young specimens of *M. bellum*, of equal size. In *M. minus* the basal angles of the carina are more produced, and spread apart farther than in *M. bellum*. The septum across the cavity is situated

higher than in species of the subgenus *Glyptelasma*, but otherwise the carina is very similar to that of *G. subcarinatum*, etc. The carina of *M. minus* illustrated (fig. 4) is 4.8 mm. long; that of *M. bellum* (fig. 5) is 7.8 mm. long. The terga are similar in general shape in *M. minus*, *M. bellum* and *M. carinodentatum*. In the former two there is a small acute tooth on the scutal margin, near the ocludent end. In *M. striatum* the terga are much higher, and are pointed at the carinal end.

The peduncle is slightly longer in *M. bellum* than in *M. minus*, though it is very short in both species.

In *M. bellum* the first cirrus has rami of 8 segments, the outer ramus broader, with the segments conspicuously convex and profusely spinose

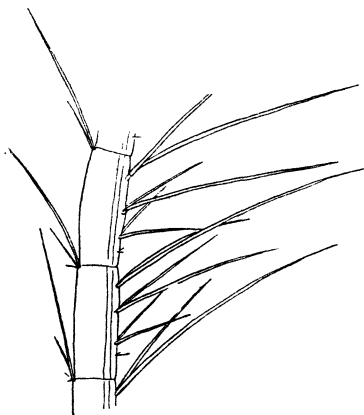


Fig. 6.—*M. minus*, 7th and 8th segments of cirrus V.⁷

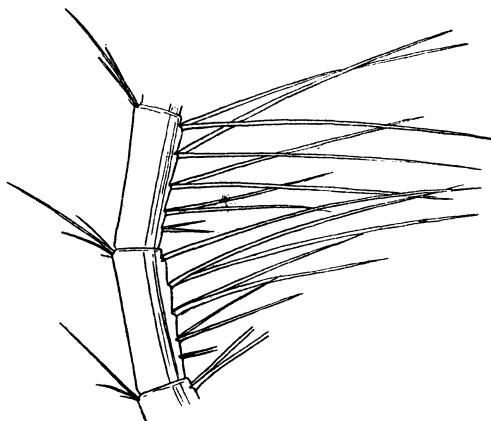


Fig. 7.—*M. bellum*, 10th and 11th segments of cirrus V.

on both margins. The inner face is also profusely spinose. It is very like the first cirrus of *M. striatum* as figured by Hoek.⁶ The inner ramus is narrower, only the distal segments projecting laterally. The posterior margins and inner face of each segment is spinose. The other cirri are slender, with 16 to 19 segments. Except the basal and distal segments, they have four pairs of large and one pair of small spines on the anterior border of each segment, and a tuft of three or four unequal small spines at the distal posterior angle of each segment (fig. 7, 10th and 11th segments of cirrus V).

⁶ *Challenger Report*, VIII, Cirripedia, pl. 2, fig. 9.

⁷ In this figure the cirri of *M. minus* are represented on a larger scale than those of *M. bellum*. They are actually very much smaller.

In *M. minus* the first cirri are formed about as in *M. bellum*. The other cirri are comparatively more slender, with only three pairs of long spines on the front margin of each segment, and a fourth very minute pair below them. The posterior distal angle of each segment has one long spine, a shorter one, and usually one or two minute spines (fig. 6, 7th and 8th segments of cirrus V).

The cirri of *M. bellum* resemble those of *M. striatum* and *M. carinatum*, while those of *M. minus* are like the cirri of *M. gracile* as described by Hoek. It will be understood that in comparisons of the cirri the intermediate segments are described, unless otherwise stated. The distal and proximal segments generally have fewer pairs of spines on the front margin. The second cirrus usually has additional spines, variously arranged.

In *M. minus* the mandible (pl. 31, figs. 7, 8) has four acute teeth, counting the lower point. The space between the upper and second teeth is double that separating the other teeth. Below the lower tooth there is a slender spine representing the lower point developed in most species of *Megalasma* and *Pæcilasma*, and shown enlarged in fig. 8. Both upper and lower borders of the mandible have delicate spiny fringes, the spinules in part arranged in pairs. The two mandibles are alike in the example dissected.

The maxilla (pl. 31, fig. 6) has a deep notch below the upper pair of large spines. Below the notch the edge projects and is closely spinose, as usual. The upper and lower borders are delicately fringed.

In *M. bellum* the mandibles (pl. 31, figs. 1, 2, 3, 4) resemble those of *M. minus*, except in having the lower point split into two teeth (figs. 3, 4) on one side of the individual examined, there being therefore five teeth in all. The other mandible of the same individual has the lower point split into four narrow teeth (figs. 1, 2). Part of the spines on the surface, near the lower points, stand in groups of two or three, as shown in the detail figs. 2 and 4. They also are in groups on the upper edge of the mandible, but elsewhere stand singly. The surface spines are drawn with camera in figs. 2, 4 and 8, but in the other figures only the general effect is given.

The maxilla (pl. 31, fig. 5) resembles that of *M. minus*, except for the somewhat greater protrusion of the lower part of the spinose edge.

The hermaphrodite form of *M. bellum* has a long penis, sparsely hairy, with a more profuse bunch of hairs at the distal end.

The individual of *M. minus* dissected contained a large egg-mass. The eggs are ovate-piriform, 0.23 mm. long (pl. 31, fig. 10).

It will be seen from the above descriptions and figures that while

related, *M. minus* and *M. bellum* differ in many details of structure, the scuta, carina, cirri and mandibles all being diverse in the two forms, which must be held specifically distinct. *M. striatum* Hoek is related to *M. bellum* by the cirri and mandibles, but differs in the terga and the sculpture of the bases of scuta and carina, etc. It differs from *M. minus* by the same characters of the plates, and also by the armature of the cirri and to some extent in the mandibles.

MEGALASMA GRACILE AND *M. GRACILIUS*.

Megalasma gracile (Hoek) was originally described (as *Pacilasma gracile*) from a Challenger station off Sydney, New South Wales. I have elsewhere called attention to the doubt attaching to material from this station, owing to the mixture therein of molluscan species otherwise known only from the Atlantic, with others known to be Australian.⁸ That *Megalasma gracile* was really from the Australian station is rendered more probable by the discovery of several specimens in the Indian Ocean by the Indian Marine Survey, as recorded by Dr. Annandale.⁹ The western Atlantic *M. g. gracilius* may prove to be identical with Hoek's form, yet in view of the wide geographic separation, and of several minor differences in the plates, I have thought best to segregate it as a subspecies. This course is likely to prove less injurious to science than an inconsiderate lumping of forms from widely separated areas, without actual comparison of specimens. Dr. Hoek has written well on this topic.¹⁰

The cirri of *M. gracilius* differ somewhat from those of *M. gracile* as described by Hoek.¹¹ He states that the posterior pair of cirri have segments "bearing as a rule four pairs of spines, the lowest pair of which is very minute, the second pair minute."

In *M. gracilius* the posterior cirri have five or six pairs of spines, the lower pair minute, on the 6th to 10th segments; beyond that point there are four pairs, then decreasing to three, and finally one or two on the outermost segments. Cirri iii to vi are practically alike. Cirrus ii has many additional spines, partly disposed in a row parallel to that on the anterior border, partly arising along the distal border of each segment. The inner ramus is much the longer, composed of 15 segments, the outer having 13 segments.

⁸ *Bull. U. S. Nat. Mus.*, No. 60, p. 89.

⁹ *Records of the Indian Museum*, I, pt. 1, p. 81.

¹⁰ *Challenger Report*, VIII, Cirripedia, p. 145.

¹¹ *Challenger Report*, Cirripedia, p. 47.

The mandible of *M. gracilius* is similar to Hoek's figure of that of *M. gracile*, the lower point being minutely bifid.

KEY TO SPECIES OF MEGALASMA.

- a.*—Peduncular margins of scutum and carina continuous with the occludent margin, in the same direction, the umbo of the scutum therefore above the basal angle of the plate. Indo-Pacific province, (*Megalasma s. str.*).
- b.*—A peduncular area on each side defined by a semicircular ridge on the bases of scutum and carina; roof of the carina very wide; width of scutum about two-thirds its length; tergum triangular, the occludent margin about half the length of the scutal. Capitulum 11 mm. long. Philippine Archipelago, *M. striatum* Hoek.
- b'.*—Peduncular area defined by a semicircular groove; width of scutum slightly more than half its length; tergum quadrangular, the occludent margin about one-fourth as long as the scutal margin. Capitulum 6.5 mm. long. Indian Ocean, *M. carinodentatum* Weltner.
- b''.*—No distinctly defined peduncular area on the bases of scuta and carina; scutum nearly twice as long as wide; occludent margin of tergum about one-third the length of the scutal margin.
 - c.*—Basal margin of carina straight with a rounded median projection, the sides narrower than in *P. bellum*; lateral margins of the peduncular orifice arched forward. Capitulum 6.5 to 9 mm. long. Segments of the cirri with 3 pairs of large spines, 1 pair of very small ones. Andaman Sea, *M. minus* Annandale.
 - c'.*—Basal margin of carina convex, deeply arched, the sides wide; lateral borders of the peduncular orifice straight. Capitulum 12 to 15 mm. long. Segments of cirri with 4 pairs of long spines, 1 pair of small ones. Hawaiian Islands, *M. bellum* Pilsbry.
- a'.*—Peduncular or basal margin of scutum making about a right angle with the occludent margin, the umbo of the scutum at the baso-ventral angle of the plate, (subgenus *Glyptelasma* Pilsbry).
- b.*—Umbo of the carina projecting beak-like below the base of the scutum, and making an angle with it.
 - c.*—Basal margin of carina as long as the basal margin of the scutum; internal basal plate long, lozenge-shaped; sides wide in the lower half.
 - d.*—Peduncle about one-third the length of the capitulum; basal margin of scutum half the width of carina near its base. Capitulum 7 mm. long. Off Australia; Indian Ocean, *M. gracile* Hoek.

d'.—Peduncle extremely short; basal margin of scutum about equal to the width of the carina; posterior cirri with more numerous spines. Capitulum 11 to 12.7 mm. long. Off eastern United States,

M. g. gracilius Pilsbry.

c'.—Basal margin of carina shorter than that of the scutum; internal plate short, wider than long; sides wide in the lower third. Capitulum 19 mm. long. Off eastern United States, *M. annandalei* Pilsbry.

b'.—Umbo of the carina not produced below the basal margin of the scutum.

c.—Occludent margin of scutum nearly straight; carina with rather narrow sides, abruptly spreading and auriculate at the base, the basal margin a straight line. Capitulum 15.5 mm. long. Off eastern United States,

M. rectum Pilsbry.

c'.—Occludent margin arched; carina with wide sides and a large internal basal plate, its basal margin V-shaped, as seen from below.

d.—Length of capitulum three times its breadth, the base narrow; scutum almost smooth. Length 14 mm. Off Culebra and Ascension Islands,

M. carinatum Hoek.

d'.—Length of capitulum twice its breadth; scutum sculptured with spaced concentric grooves and fine radial impressions. Capitulum 16 to 25 mm. long. Off eastern United States,

M. subcarinatum Pilsbry.

EXPLANATION OF PLATE XXXI.

Figs. 1–4.—*Megalasma bellum* (Pils.). Mandibles and more enlarged lower points of same.

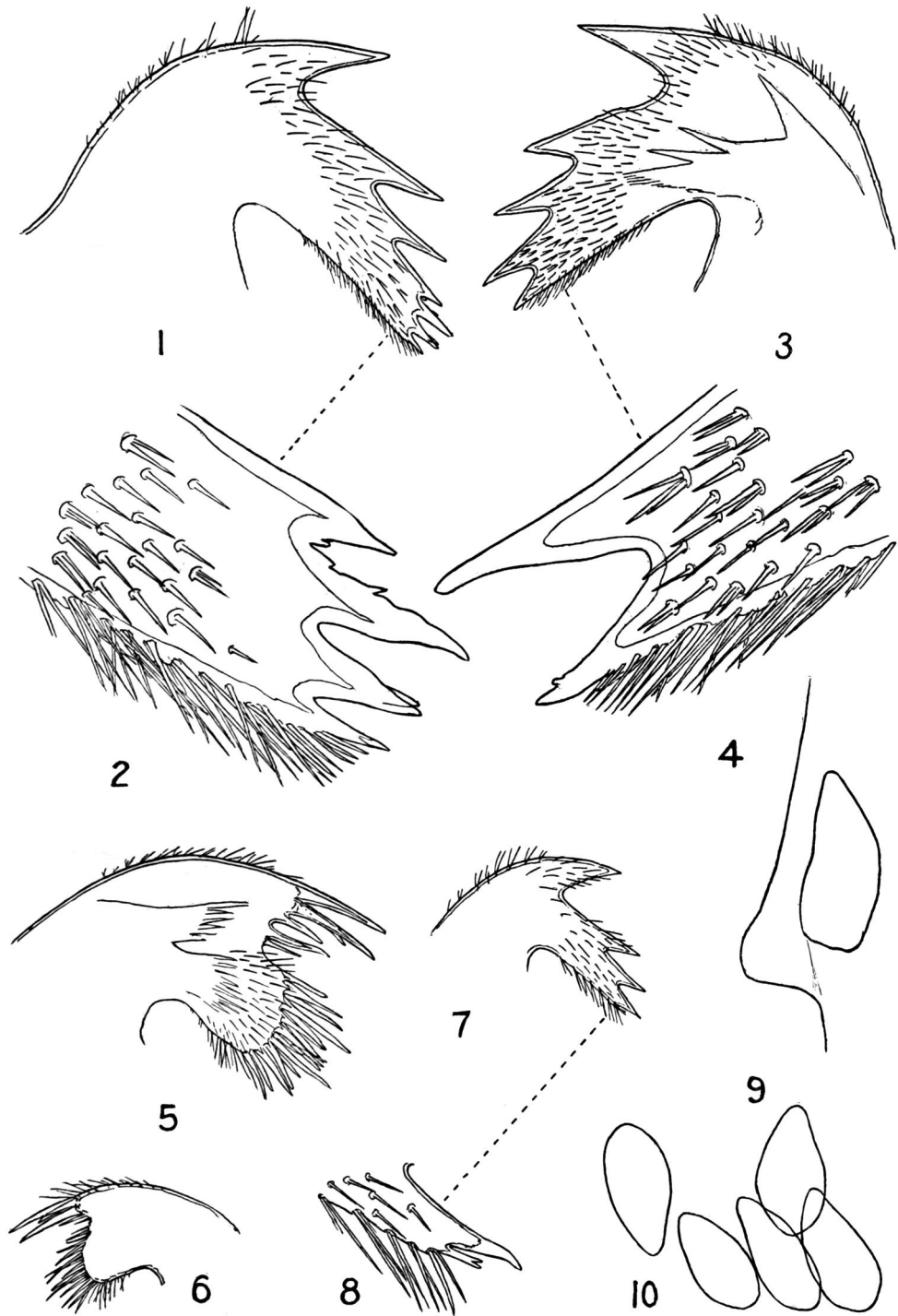
Fig. 5.—*M. bellum*. Maxilla.

Fig. 6.—*M. minus* Annand. Maxilla.

Figs. 7, 8.—*M. minus*. Mandible and its lower point more enlarged.

Fig. 9.—*M. minus*. Outline of primitive shell and adjacent margin of the scutum.

Fig. 10.—*M. minus*. Group of ova.



PILSBRY ON THE CIRRIPEDE GENUS MEGALASMA